1.00

E. Hart Thurman

CONTRIBUTIONS TO WESTERN BOTANY.

. . . No. 3 . . .

BY MARCUS E. JONES.

ZOE, Vol. 3, No. 4. January, 1893.

EX LIBRIS
JOSEPH EWAN

[Reprint from Zoe, Vol. III, January, 1893.]

CONTRIBUTIONS TO WESTERN BOTANY. No. 3.

BY MARCUS E. JONES.

CAULANTHUS CRASSICAULIS Watson, is perennial. The four stamens are declined and close pressed to the lower petals, and the two others are as tightly pressed to the upper petals, after the fashion of the Labiate stamens. This grows in loose soil in alkaline valleys as well as in better-drained localities with little alkali. It blooms mostly in the month of May, and is common in Western Utah as well as in Nevada.

STANLEYA VIRIDIFLORA Nutt. The very imperfect description of the type in Coulter's Manual, King's Report, and the better one in the Flora of North America, Torrey and Gray, make it uncertain whether this plant is a new species or not. The salient points of the type are the simple stem, erect and glabrous, leaves cuneate-obovate ("obovate or lanceolate," Watson in King's Rep.), entire or few toothed at base of stem, upper ones rapidly reduced so that the upper stem is nearly naked, entire ("lanceolate, sessile, clasping," Watson l. c.); raceme long and crowded with flowers, which are greenish yellow, with linear sepals and petals, anthers very long and linear, pedicels ½ inch long, stipe an inch (" ½ inch," Watson l. c.); long and narrow torulose pod. Said by Nuttall to grow on shelving hills, and apparently by Watson in valleys.

My plants, of which I have a large suite gathered at different places, and which I carefully studied as they grew, are short-lived perennials (3 years old at least), with stems all ridged and more or less winged throughout, the wings sometimes about a line high; leaves lanceolate, barely acute and entire, but with two rounded lobes at the truncate base, root leaves pseudo-petioled and wing margined, as also the lower stem leaves, 6 to 12 inches long and ¾ inch wide, thick, leathery, and light green, smelling like cabbage,

stem leaves rapidly reduced upwards, sessile, apparently (but not) clasping, uppermost ovate to sagittate, or hastate, acuminate, the rounded or almost acute lobes 3 to 4 lines long, petioles of root leaves grooved; spikes sessile and in the fully developed plants many branched; the central branch long, 1 to 2 feet, densely flowered; sepals in the bud greenish yellow, after anthesis purple (usually) and reflexed, linear-oblanceolate, obtuse, concave, almost hooded; blade of petals crumpled crosswise, edges jagged, linear, ½ line wide, yellowish green, inconspicuous, 4 to 6 lines long, and thin, claw thick, fleshy, triangular subulate, 6 lines long and a line wide at the saccate base, glabrous, whole petal just equaling the filiform filament, which is round, glabrous, and scarcely enlarged at base, anther loosely coiled 2½ lines long, obtuse, narrowly linear, fixed by the very base and one-sided; pedicels in flower 2 lines long ascending and in fruit 4 lines long and horizontal; pods drooping, 2 to 3 inches long, stipe 8 to 10 lines long, septum less than ½ line wide. It grows among pinons and cedars on gravelly southern slopes of hills at 6,500 to 7,000 feet altitude in the Schell Creek and Sprucemont Ranges, Nevada, and flowers about July 15 to August 15. The greenish yellow sepals are rather conspicuous. It is not very common It differs from the type so far as the descriptions go in the winged stems, branching habit, crumpled petals, auricled or hastate upper leaves, and longer pendent pods. But it may be that these characters were overlooked in the type. Should this plant prove to be distinct it may bear the name of *Stanleya collina.*

LEPIDIUM HETEROPHYLLUM. I propose this name for the *L. montanum* var. *alpium*, Watson, King's Rep. and *L. integrifolium* var. *heterophyllum*, Wat. Am. Nat., Ix, 268. I fail to see anything warranting the connection of this shrubby based, cliff-growing, decumbent, high altitude plant with *L. montanum* or the alkali-loving *L. integrifolium* of the valleys. It reaches an altitude of nearly 9,000 feet in the Wasatch and shows no gradation into either species either in habitat or character so far as I know.

POLYGALA ACANTHOCLADA Gray. It may be of interest to give the characters of the flowers of this plant as they are in nature and not in dried specimens: Green parts of calyx 3, ovate, barely acute, 1 line long, the two upper (this is as the flower appears on the plant with the keel uppermost) close together, lower one alone, the two

petal-like ones obovate-oblong, widely spreading, cucullate, barely acute, 2 lines long, ascending, white; keel truncate, 1½ lines long, 1 line wide, broadly obovate, greenish; banner oblong-linear, expanded at end and rhomboidal, erose and notched, greenish, tip purple with veins running down ½ line, 2 lines long in all. The keel has an oblong orifice with the lips turned back at more than a right angle; stigma truncate or club shaped and included in the hood; pod oblong ovate, 2½ lines long and 1½ wide, deeply notched. The plant is a shrub 1 to 3 feet high, with gray bark and stems often an inch thick, widely and rather intricately branched and spiny. Gravelly hillsides in dry places. I have collected it at Lee's Ferry on the Colorado River near Southeast Utah, and found it common in Western Utah and Eastern Nevada.

VIOLA BECKWITHII Torr. The description of this plant in King's Rep. is inaccurate, but the figure, etc., in Beckwith's Rep. are better. The following are the characters of our plant as it grows here; it is locally abundant. Stigma cuneate and truncate, glabrous, petals also glabrous, 2 upper ones dark purple, the rest white with a yellow claw and purple veined, lower petals broad, truncate or emarginate, flowers rather large; sepals linear oblong, spur not over a line long; pubescence minute and dense; leaves 3-divided, divisions petiolulate, lateral ones 3 to 6 lines long, terminal ones 6 to 12 lines long, lobed or cleft into many linear or oblong segments.

LUPINUS SULPHUREUS Douglas. This little known plant I discovered growing abundantly in Eastern Nevada, and I think it is quite probable that it will be found to be nearer *L. sericeus* than has been supposed. My notes on the flowers were taken as they grew. When the flowers are just opening they are white with a yellow streak in the middle of the banner, which is also flecked with 4 or 5 small purple spots; the whole flower soon turns yellow, the middle of the banner deeply so. The calyx is long-spurred, spur and all but the tip of the upper part of the calyx white and streaked with blue, the lower part of the calyx and tips green. It grows 1 to 2 feet high, in clumps from a hard woody root, on gravelly slopes, flowering in June. I have a very few specimens with a suspicion of blue on the banner.

PSORALEA CASTOREA Watson. As I suggested in a previous note (No. 2) this includes *P. mephitica* Watson. A careful compari-

son of my many specimens from Southern and also Eastern Utah and Colorado shows that the distinctions relied upon by Watson to separate the two species are valueless, while the "mephitic" odor was doubtless due to the animal rather than the vegetable kingdom.

The following characters will fit my suites of specimens. Leaves 1½ inches long, from rhomboidal obovate to spatulate, acute, apiculate or retuse; stipules persistent or caducous, the larger ones 1 inch long, ovate, obtuse, and persistent, the smaller ones ⅓ inch long, ovate-lanceolate, abruptly contracted into a long acumination and caducous; stems none to 4 inches long; petioles 2 to 6 inches long; peduncles shorter than the leaves; bracts ovate, scarious, obtuse to abruptly contracted and with a long acumination, equaling the scarious, inflated calyx and blue and white petals; calyx lobes linear to lanceolate, acute or long acuminate; spikes 1 to 3 inches long; peduncles 1 to 4 inches long and stout; pods lanceolate, glabrous below the middle and long villous above it; roots very deep and apparently tuberous, but really woody and all connected underground; whole plant densely pubescent, with short or long hairs, upper side of leaves less so or glabrous. Grows in patches either in sandy places or on rocky slopes in dry places; flowers in May.

ASTRAGALUS. Doubtless many have had much difficulty in determining species in this genus from the flowers alone; at least I have found it exasperatingly so, and, as the pods are often not to be had when the flowers are seen, and as the flowers have been almost ignored, I began some years ago to study the flowers with a view to determine if they had any specific value, and with good results; how good cannot yet be determined fully.

I find that the arching of the banner and its shape are valuable, the shape of the sulcus in the banner, the shape of the white spot on the banner in a general way, and the backward folding of the sides of the banner are valuable; the shape and length, as well as the position of the wings, are valuable. Often the wings are concave to the keel or flat, horizontal, or arched upwards, connivent over the keel or with the blade edgewise to it, and so like the outspread wings of insects. The shape of the keel, its arching and tip, are also of value in separating species. I find little or no difficulty in separating species by these characters in conjunction with the leaves. Whether they are of value in making sections I doubt,

but they are good in making smaller divisions, where now we have considerable difficulty. I hope Californian and Northern botanists will report on these things with their species. It is necessary to take the notes on flowers when they are growing, and as soon as they are fully opened, before they have assumed a false position of banner or wings. The following are my notes on living flowers, with descriptions of some new species, following the order of Watson in King's Rep. in a general way:—

ASTRAGALUS DIPHYSUS Gray. Banner broadest at base, sides slightly reflexed at the top, not at all at base; white spot broadly cuneate and very slightly notched at top. It comes within a line of the tip of the banner. The banner is ascending less than 30°, sulcus V shaped. The calyx is cleft on the upper side, acute at base, and the lobes are unequal, the lower the longer.

ASTRAGALUS DIPHYSUS Gray var. LATUS. Like the type but the leaflets 3 to 5 lines long, 6 to 8 pairs, ovate or obovate to oval, obtuse to emarginate; calyx teeth shorter and broader, 1 line long, the tube 3 lines long; pod oval, straight, abruptly acute, completely 2 celled, rather deeply sulcate both dorsally and ventrally. Whole plant glabrous even to the pods, subdecumbent; lower stems enduring from year to year, many stemmed from a deep, thick, woody root, stems spreading more or less underground. The flowers are purple from a light-colored base, 6 lines long, and the cross section of the pod is nearly two circles, joined at the side. Schell Creek Range, Nevada, May, on the hillsides.

ASTRAGALUS BECKWITHII Torrey. Flowers cream white, never purple; banner almost erect, deeply notched, sides not at all reflexed, except at a point opposite the tip of the keel, where it is turned back for a space of 2 lines long, and at a point near the tip, and so is fiddle shaped, water lined. The sulcus in the upper part is broadly V shaped, but in the lower part of the banner it is almost circular, making the base of the erect part of the banner very convex on the outside, and narrowed at its insertion into the enlarged club-shaped lower part, and this narrows as it enters the calyx; banner 4 lines wide and 6 lines long above the calyx; wings obliquely oblanceolate, narrowed at the tip and nearly acute, 2 lines wide, nearly straight, 3 lines longer than the keel; keel long and narrow, slightly incurved, faintly purple veined at tip; leaflets generally emarginate;

pods without mucilaginous matter. This is quite common from the Wasatch Mountains to the western side of the Fish Spring Mountains, in Western Utah. West of there it is replaced by the next. It grows on gravelly hillsides. Pods purple spotted, thin and acute at each end.

ASTRAGALUS BECKWITHII Torrey var. PURPUREUS. This plant, though it has all the marks of a good species, I do not feel like describing as such till one or two things can be settled about it. Banner purple, fiddle shaped, notched at top and broad at base, arched to nearly 90° and abruptly, white spot fan shaped and streaked deeply (to the base on the sides) with purple; sulcus ¼ circle except at the base, where it is semicircular, fusiform longitudinally; the purple streaks on the white spot are united at the base of the sulcus into a purple ring; the banner is bent at a point 2 lines beyond the calyx teeth; wings obliquely ovate, rounded and obtuse at the apex, white from the tip to the keel and purplish beyond, upwardly curved, 2 lines wide, 2 lines longer than keel; keel purple and very dark at tip, incurved 100° to base, blunt. Whole flower curved upwards, purple and never yellowish except when old. The other characters are leaflets 6 to 12 pairs, inclined to be diamond shaped, 6 lines or less long and over ½ as wide, rounded, truncate or retuse; stems ascending, angled as well as petioles and peduncles; flowers 6 to 10, at first in a head but lengthening to 1 to 2 inches; penduncles shorter than the leaves; calyx as in the type, yellowish but with nigrescent hairs, tube 2 lines by 1½; teeth 1 line more, subulate from a broad base, almost black; calyx spreading in flower and reflexed in fruit, but the stipe (equaling the teeth) bent upwards so that the pod is nearly vertical; pod acuminate at each end, inwardly curved ventrally, so as to make ⅓ to ½ the arc of a circle, 1½ to 1 inch long, dorsal sulcus intruded ½ line, sulcate dorsally always at base, but not in the upper half when pod is much curved; when nearly straight and only acute at base and apex (which occasionally occurs) the pod is deeply sulcate, finely corrugated, cartilaginous, filled with a mucilaginous pulp when immature; seeds flattish, nearly round, with a prominent hilum, 1 line wide. Fully mature pods are usually obcompressed so as to be flat, while at the ventral suture they are compressed, making the cross section T shaped, usually purple spotted. This differs from

the type in the purple flowers, keel ½ broader, longer pod, which is cartilaginous and so thicker, pulpy pod, while the type has a thin and almost transparent pod, without pulp when young. If this latter point holds good in all cases, it is a good species. It is at once distinguishable from the type everywhere, and never has been found east of the Deep Creek Mountains in the western edge of Utah.

ASTRAGALUS CANADENSIS L. and A. MORTONI Nutt. have the following characters in common: Flowers in dense spikes, horizontal; calyx white, flattened, somewhat gibbous, hairy, tips broadly triangular and tufted with hairs, short; banner arched in a wide arc, sides reflexed, at tip the most, very little elsewhere; sulcus triangular and acute at tip of banner, rounded at base of banner; banner equaling the keel, ochroleucous; wings ascending and narrow, exposing both the tip and base of keel, obtuse, a line longer than keel.

ASTRAGALUS CANADENSIS has calyx decidedly notched on the upper side; bracts subulate, short; wings linear but slightly wider at blunt tip; keel little incurved; leaves in about 13 pairs and inclined to be lanceolate; spikes not denser fruited than in the other species. The keels of both species are veined.

ASTRAGALUS MORTONI Nutt. Calyx teeth not unequal; wings oblong-lanceolate, 1½ lines wide at base; keel purple tipped, arched to ⅓ of a circle; bracts ovate to lanceolate, 1 to 2 lines long; leaves inclined to be oblong and much smaller than in *Canadensis;* flowers in a closer and shorter head. Pods pubescent and densely aggregated, ascending as in the other species.

A. Canadensis was just coming into bloom at Grinnell, Iowa, on August 16, 1892, at 1,000 feet altitude, while *A. Mortoni* was well in bloom at Muncy, Eastern Nevada, on July 6, 1891, at 6,000 feet altitude.

ASTRAGALUS DODGIANUS, n. sp. Many stemmed from a woody root; stems very slender, flexuous, branching from the base, 6 to 24 inches long; stipules sheathing at the base, membranous and barely pointed, upper ones connate at base and very broadly triangular; whole plant except the glabrous pods minutely and sparsely pubescent; leaves 1 to 2 inches, with proper petiole ½ an inch; rachis leaf-like; leaflets 4 to 5 pairs, narrowly elliptical to linear, 2

to 4 lines long; peduncles 3 to 8 inches long, with racemose, scattered flowers on the upper half; flowers very small, erect to horizontal; calyx nigrescent, less than a line long; campanulate, triangular teeth a line long; calyx acute at base, on a pedicel ½ a line long, subtended by a triangular bract 1 line long; corolla arched; the very blunt, much incurved, and rounded, purple-tipped keel surpassing the calyx tips less than a line; wings oblong, entire, about a line longer than keel, ascending, flat to keel; banner abruptly bent at calyx tips to a right angle, 2 lines longer than keel, broad, deeply notched, white or light pink; pods ascending to pendulous, linear-oblong, dorsal suture straight, ventral slightly curved, minutely stipitate, flat and vetch-like, abruptly acute or apiculate, membranous, reticulated, with no trace of a dorsal intruding septum; seeds (6 to 10) broadly ovate to almost reniform. Were it not for the characters of the pod this might be referred to *A. Robbinsii*, var. *occidentalis*, Watson. May 7, 1891, at Thompson's Springs, Eastern Utah, on rocky slopes, rare. Named for Col. D. C. Dodge.

ASTRAGALUS IBAPENSIS, n. sp. Allied to *A. Robbinsii*, var. *occidentalis* apparently, but leaves seemingly quite different, and pod also. (?) The description of Watson's variety is very meager and gives almost no leaf or floral characters. This plant is very slender; stems ascending from a deep, erect and slender perennial root; leaflets 1 to 7, elliptical to linear, lower obtuse, the upper acute, all but the terminal ones 2 to 6 lines long, the terminal one twice as long as the others; upper leaves with one long, linear leaflet, acute at each end, 1 to 1½ inches long, 1 line wide, gradually tapering into the rachis or petiole, which is 6 lines long and not jointed to it, occasionally with a single falcate, very acute, linear leaflet at base; stipules ovate to broadly triangular and mostly connate, usually acute; very slender stems grooved; whole plant minutely strigose pubescent, even to the pods, which are more densely so and not black hairy; penduncles slender, racemosely arranged on stems, 1 to 2 inches long; flowers white, 1 to 3, at the top of peduncle; spreading pedicels a line long and with an ovate bract at base, apparent reflexed in fruit; calyx shortly campanulate, a line long and as broad; teeth triangular, ½ line long; corolla 3 lines longer than calyx and teeth; banner very broad, abruptly arched at tip of teeth

to a right angle, erect part 1½ lines long; keel surpassing calyx teeth 1½ lines, incurved with the end straight, blunt, purple tipped; wings barely equaling the keel; pod oblong-linear, very shortly stipitate, 6 lines long, 1½ lines wide, abruptly acute, both sutures prominent, flattened, apparently 1 celled, ventral suture arched, dorsal straight.

June 23, 1891, Deep Creek Mountains, Western Utah, at 5,500 feet altitude, among brush. The arching of the ventral suture of the above two species would suggest *A. Robbinsii*, as that feature is very rare in Western plants, but the racemosely arranged short peduncles and upper simple leaves are quite peculiar.

ASTRAGALUS BIGELOVII Gray. This in its flower is allied to the *A. ériocarpus* group along with *A. amphioxys*, and apparently should include the *A. Mathewsii* Watson if there are no other good characters than those given by Watson. Banner arched 80° in a gentle curve, sides reflexed from calyx to tip 100°, the folded part being 1½ lines wide at base and gradually reduced upwards so that the outline of the banner as one looks at it is oblong with straight sides and an enlargement at the base; sulcus a line deep and ¾ wide, broadly V shaped and continuous to the apex of banner, white spot occupying the whole of the sulcus and to within a line of the top of banner, narrowly oblong, emarginate, purple tinged below; base of banner, sides and tip rose purple, darker at the base; wings linear, ¾ line wide, with a little lobelet on upper side near the base, obtuse, ½ line longer than keel, ascending 30°, dark rose purple at base and the upper two lines white, nearly flat with the tips slightly incurved and so not quite vertical; keel dark purple-tipped, blunt and moderately incurved; banner rising 4 lines beyond the tip of keel, in all 5 lines longer than tip of calyx lobes; calyx pink, a little inflated, narrower with age and white, somewhat flattened, gibbous, ascending 45°; bracts 3 lines long and green.

Taken from specimens gathered at Rincon, New Mexico, April 15, 1892. It is also abundant in Eastern Utah.

ASTRAGALUS GLAREOSUS Douglas. The plants which I have hitherto distributed as *A. glareosus* are *A. Chamæleuce* Gray, while this plant occurs sparingly throughout the Great Basin region of Utah, and is credited to Southern Idaho, and by Coulter to Wyoming also. I have hitherto considered it as *A. Chamæleuce* but it

is clearly not that plant, and differs from *glareosus* in having a 2-celled pod that is 1 celled at apex only, the flowers also are cream white, and not "blue," indistinctly purple veined. Pods long, 1 to 2 inches, acuminate, lanceolate, fleshy when green, much compressed, 2 celled by the intrusion of the dorsal sulcus, long-appressed hairy, often sulcate both dorsally and ventrally, dorsal sulcus very deep; banner extending 4 lines beyond the calyx teeth, slightly and gently arched, notched, sides reflexed at base only, 2 lines longer than the blunt, incurved and purple-tipped keel; sulcus deep, semi cylindric, wings linear, a little longer than the keel, horizontal at tip; calyx cylindrical, 5 lines long; teeth subulate, a line long or more, nigrescent peduncles 2 inches long, shorter than the leaves and prostrate in fruit except in the shade, leaflets narrowly lanceolate to narrowly oval, 3 to 5 lines long and 1 to 2 wide; whole plant coarsely silky pubescent with appressed hairs; stemless, not at all woolly. It grows under sagebrush in the valleys or lower hillsides and is quite distinct from any other species that I know. It flowers early in May.

ASTRAGALUS UTAHENSIS, T. & G. Though it is difficult to always separate this from *A. eriocarpus*, and less so from *A. Purshii* in the herbarium, yet it is not at all so in the field, since *A. eriocarpus* flowers at least a month earlier than *A. Utahensis* and is out of bloom before the other blooms. *A. Purshii* blooms as early or earlier than *A. eriocarpus* and is a high altitude plant, *i. e.*, does not grow in the valleys, the home of the other two species, though the latter sometimes go up to 7,000 feet altitude. In *A. Purshii* the pubescence of the leaves is quite different, while the matted habit and narrow leaves and short woolly pods distinguish it at all times. It would certainly be considered a hybrid from the other two if they grew together with it but they never do.

In *A. Utahensis* the banner is oval as one looks at it in the flower, rather deeply notched, white spot broadly cuneate, tridentate or with a single acuminate tooth from the center of the rounded or truncate apex, sides of white spot beautifully veined with narrow nearly parallel purple lines running down to the base; banner brilliant pink purple; wings linear, 2½ lines longer than keel, slightly enlarged at tip, rounded or almost truncate, straight, purple throughout; tip of keel dark purple. This is one of the handsomest flowers in the West, but though very common in Central Utah seems to become less so westward.

ASTRAGALUS ERIOCARPUS Watson. Flowers brilliant pink purple, and closely resembling those of the above, but sides of banner not at all reflexed, either notched ½ a line deep or not at all, ascending 45° or less; white spot almost obliterated by rather broad, palmate, purple veins, which are united into a solid purple spot at base; sulcus in banner semi-cylindric; wings a line longer than keel. Deep purple tipped, obtuse, scarcely broadened at base, a little narrowed at apex; keel dark purple, scarcely incurved, very blunt; flowers nearly as large as in *Utahensis*, but fewer. It is abundant in the valleys, but not in alkaline soil.

ASTRAGALUS AMPHIOXYS Gray. This plant has no characters that I do not find in *A. Shortianus*, except the pubescence of the calyx, which in the former is appressed and silky or strigose, and in the latter is spreading and loose. The shape of the pods, that both Gray and Watson had to abandon in regard to *A. cyaneus*, is equally valueless in the new species created. There may be a character in the flowers to keep up the species, as well as the pubescence. I have not studied *A. Shortianus* in flower as I have the present species. I have never seen any true *A. Shortianus* in Utah or Western Colorado, all the plants belonging to *A amphioxys*, which is very common. The usual form has the banner of the flower ascending remotely from the calyx, which gives the flower a slender, long look, but there are forms with a short corolla. There are also three forms of pod. One is the typical pod, as described by Gray, not fleshy to any extent. Another has a shorter pod, which is less acute at apex, often small, and rather blunt at base. The other has a very fleshy pod, which, on drying, becomes wrinkled with prominent sutures and intermediate in form. While all these forms run together, and have no floral character that is constant, so far as I have seen, they all, without exception, have the appressed pubescence of calyx. The floral peculiarities are brilliant pink purple flowers; banner with sides reflexed 10° to 60°, or even more. When little reflexed the outline is oval, when much it is oblong or tapering upward, ascending; sulcus 3 lines broad and very shallow, only concave, 4 lines long, white spot truncate and often deeply notched, oblong or broadly cuneate, ragged on the upper end, with little purple veinlets, stippled with fine purple spots; banner darkest near the white spot, lighter on the edge; wings linear to oblong lanceo-

late, rounded, obtuse, oblique, ascending, concave to keel, nearly horizontal and connivent over the keel, forming an arch over it, 2 lines wide and ½ a line longer than keel, purple; keel all purple. One form has banner 5 lines long, short; calyx 3 lines long, and teeth 1½ lines long; pods hoary, and whole plant densely silky. Another form has fleshy pods, less hairy; calyx 4 lines and teeth 1 line long; keel rounded, ½ narrower than the above; flowers 8 lines long. This plant is instantly recognized by the arched and connivent wings and stippled white spot.

ASTRAGALUS CHAMÆLEUCE Gray. (Distributed by me as *A. glareosus*, but not in my sets.) Flowers 1 inch long, pink purple, few; banner in flower oblong-oval, sides reflexed 45°, plain, dark pink-purple with darker veins, tip with a central notch ¾ line deep, and with two shallow ones adjoining, seldom absent; white spot comes within a line of the edge all around and as low as the keel, narrower below, obovate-cordate, edge ragged, with red-purple veins; below and a line apart are two patches of anastomosing red-purple veins; wings narrowly oblong, dark purple at tip, oblique, rounded, tip twisted just below tip of keel, and horizontal; keel narrow 2 lines below tip, blunt and rounded, dark purple at tip; pod very fleshy, cartilaginous, and sparsely short hairy. It always grows in firm, damp meadows, in mountain parks, or high valleys. It blooms in June and July. It is a matted, woody-rooted, prostrate, densely branched, silvery plant, with short peduncles among the leaves.

ASTRAGALUS IODANTHUS Watson. This is the most variable plant of the genus in Utah, and may include several species recently erected. The sides of the banner are reflexed, so that the outline is oblong, notched; white spot, deep purple veined; banner deep purple below, and shading to white at tip, or purple throughout, slightly sulcate, ascending 30°, sides most reflexed at base; wings long, dark purple at base, and white from tip of keel to apex, 3 lines longer than keel, rounded, obscurely erose or notched, ascending near the tip. The pod is fleshy, black hairy or nearly glabrous, plain or spotted, straight or arched into a semicircle, round or obcompressed, sulcate or not. It grows everywhere except on alkaline flats in the valleys, but does not go beyond the higher foothills of the mountains.

ASTRAGALUS PEABODIANUS n. sp. Inflati. Perennial, matted cæspitose from a branching root; stems 3 to 6 inches long, densely branched and prostrate, very leafy, root not woody; leaves 1 to 2 inches long, including the ½-inch petiole; leaflets 4 to 8 pairs, 3 to 4 lines long, 1 to 1½ wide, oblanceolate to narrowly oval, rounded at apex and acute at base, edges contiguous, softly pilose with spreading hairs, as well as all the rest of the plant, even to calyx and legume, but the latter rather densely long pilose; peduncles an inch long, 3 to 6 flowered, and loosely so; flowers ascending, in fruit horizontal, pedicel very short; calyx campanulate, a line long, teeth the same and setaceous; banner abruptly reflexed at tip of calyx teeth, broad, notched, white or purple, 3 lines long, erect part 2 lines long; purple tipped keel surpassing calyx teeth by 1½ lines, arched, the acute tip incurved to nearly a semicircle; wings barely surpassing keel, lanceolate, entire, obtuse; pods 6 lines long, membranous, ovate or lanceolate, acute, sessile, when ripe incurved to nearly a semicircle, cross section triangular and acute at ventral suture, with rounded lobes at base, dorsal septum not intruded, but dorsal sulcus always so at base of pod and to the middle; 1 celled, no intrusion of ventral suture, but the suture is rather thick, while the dorsal is inconspicuous.

Resembles *A. Parryi* in habit, and is allied to *A. triflorus* and *A. triquetrus*, but quite different; clay soil, at 5,000 feet altitude, Thompson's Springs, Eastern Utah, May 7, 1891. Dedicated to George Foster Peabody.

ASTRAGALUS GEYERI Gray. Banner oval to ovate, but sides generally turned back at some angle less than 90°, then the outline is oblong, slightly notched, white or very light purple. faintly purple veined; white spot scarcely visible, coming within ½ a line of the sides and end; banner ascending to 75°; sulcus shallow, scarcely contracted at base; banner 1½ lines longer than wings, and wings 1 to 1½ lines longer than keel; blade of wings obliquely ovate, obtuse, ascending 30°, 1 line wide; keel a line longer than calyx teeth, incurved 100°. I have doubts that it is annual, for the slender roots seem to have tubers on them. Very common in gravelly or light soil in the valleys and lower slopes. It blooms May to June.

ASTRAGALUS PLATYTROPIS Gray. This interesting subalpine plant is found only on the high mountains, occurring as far east as the

Schell Creek Mountains only. It may, however, exist on the Deep Creek Mountains. It is one of the earliest bloomers, close to snow. It is inclined to spread from the roots, but never forms mats. It is rare. Banner white or dirty, tinged with yellow, varying to light lead colored, bent abruptly to 45°, from mouth of calyx, concave, and so the sulcus is very widely V shaped, hooded at apex by the narrowing of the sulcus, 3 lines long, notched, and often with accessory notches, about as broad as long but a little wider at base than apex, sides not reflexed or but little, slightly purple veined opposite mouth of calyx; wings arcuate upwards and exposing the whole keel, obliquely lanceolate oblong, or nearly so, obtuse tip bent outward forming with the keel the letter T, just equaling the keel; keel abruptly bent 90°, purple, dark at tip, point rounded, equaling the banner; pod dark and dark purple mottled, ovate, ¾ by ½ inch, abruptly pointed, straight, papery, and much inflated, oblong oval, cross section oval contrary to the partition and emarginate on each side, prostrate when ripe. Scapes erect to decumbent. July.

ASTRAGALUS TOANUS n. sp. Allied to *A. nudus*. Lower leaflets 3 to 6 pairs, upper ones reduced to the long and cylindrical rachis; pods 2 to 4 on the ends of rather long peduncles; erect, ¾ to an inch long, 3 lines wide, compressed, erect, straight or curved, acute, thick and corrugated, both sutures prominent; sessile, lanceolate oblong, with very acute edges, cross section elliptical, seeds 1½ by 1 lines, calyx teeth minute, triangular; calyx 3 lines long. This grows in clumps like the others of the section. It is nearly glabrous throughout, erect, 2 feet high. It was out of flower July 21, 1891.

Found on the slopes of the Toano Range, Eastern Nevada, in open ground. It can neither be referred to *A. nudus*, *A. pectinatus*, or *A. Grayi*, but is intermediate between *A. nudus* and *A. pectinatus*. It may be that all four are forms of one polymorphous species, but I do not know of connecting forms.

ASTRAGALUS ARTIPES Gray. This plant is so like *A. Beckwithii* (except possibly the fiddle-shaped corolla) that it will be passed over generally when not in fruit; however, the calyx teeth about equal the tube, and are thread-like at tip; pod 1½ by ¾ inches, spotted, straight, tip slightly curved and almost blunt, base truncate; stipe equaling the calyx teeth; no apparent dorsal suture, ventral not prominent nor inflexed; pod probably round in cross section but

somewhat flattened or sulcate ventrally, 1 celled; seeds not round; calyx erect in fruit; pods erect or spreading. It is 1 to 2 feet high, slender. It was collected in gravelly soil at about 5,000 feet altitude in Utah Valley, May 16, 1891. The leaflets are broadly lanceolate to oval, obtuse to emarginate, 3 to 6 lines long, 10 to 14 pairs. Hitherto this has been supposed to be a southern species, but it has doubtless been overlooked.

ASTRAGALUS CALYCOSUS Torrey. This most interesting and badly named little species proves to be very common in all the ranges and hills west of the Wasatch Mountains, Utah. I have gathered it as far west as Humboldt, Nevada. Watson's description in King's Rep. is faulty also. Outline of banner oval, cleft a line deep, sides reflexed 100°, generally cream white but often purple; white spot broad, with cuneate sides to the middle where it widens again, broadly emarginate at apex; sulcus rectangular and broader than deep; wings very closely appressed to keel its full length, red purple to tip of keel, white beyond, deeply cleft, lower lobe 1 to 2 lines long and like a normal wing, the upper lobe is ⅓ wider, bent upward and inward till it touches the banner, both lobes narrowed and rounded at tip, usually from the cleft in the wings a long thread like lobe arises and is nearly as long as the lobes; keel enlarged just above the calyx so as to make a hollow in the banner, with a decided hump near the base of keel; calyx notched deeper on the upper side; pod always arched when well developed, acute, 4 to 12 lines long, 2 celled, cross section ovate with a cordate base. Flowers erect or prostrate, pods narrowly oblong to linear, usually prostrate. It is not subalpine, as given by Watson; it is rare above 7,000 feet altitude and abounds in the valleys in gravelly soil, 5,000 to 7,000 feet altitude. Torrey's and Watson's specimens seem to have been starved and with a poorly developed pod.

ASTRAGALUS ATRATUS Watson var. STENOPHYLLUS n. var. Flowers smaller, leaves narrowly linear, short, minute, or wanting, and only the rachis present, always so in the upper leaves.

This is No. 3840 of my sets of 1882. Collected June 14, 1882, at Palisade, Nevada, distributed as "Astragalus n. sp."

ASTRAGALUS FILIPES Torrey. I believe there is an earlier name for this, but the old name will be the more familiar, and equally as good for my purpose. Banner light cream colored, arched at right angle,

oblong, 4 lines longer than keel, expanded at base like *A. Beckwithii*, sides reflexed '20° or less, groove very shallow and acute, scarcely narrower at base, not enlarged or narrowed on the outside toward the base; banner acutely notched at apex, ¾ line deep; wings obliquely obovate or lanceolate, ascending 45° so as to expose the bottom of keel, concave to keel, entire or obscurely toothed at rounded apex; keel incurved 100° or more, blunt, tipped with yellow. **Schell Creek Mountains, Nevada, July, 1891.**

ASTRAGALUS KENTROPHYTA Gray. It is hard to believe that a subalpine plant in the Wasatch can be the same as one growing on the driest slopes of valleys in the arid regions, but so far I can see no distinguishing characters. The floral characters of the arid plant are these: calyx bent like Hedeoma; banner arched less than 90° abruptly and with a hump below the bend also, cucullate, sides very concave and little reflexed; sulcus very shallow; banner contracted about a line below the tip, so that the general outline is oblong, tip abruptly reflexed or not at all, deeply notched, a little broader at tip than below, finely striate veined with purple; wings connivent, oblong-ovate, obtuse or barely acute, 1½ lines longer than keel, ascending; keel purple tipped, sharp, and much incurved. Very dry **knolls in valleys of Eastern Nevada, fruit in July.**

In my last "Notes" in ZOE I inadvertently transposed the terms dorsal and ventral in describing my species of *Astragalus*.

CERCOCARPUS LEDIFOLIUS Nutt. In a former communication in ZOE I gave some general details of the relation of the type to the variety *intricatus* Jones. Having now examined minutely all my material from all sources and also that in the Shaw Botanic Gardens (the Engelmann collection), my conclusions are that there is but one good variety of *C. ledifolius* and that one is the var. *intricatus*, which does not deserve higher rank. *C. parvifolius* Nutt. var. *breviflorus* Jones. I reduce from the *C. breviflorus* Gray, Pl. Wright 2 p. 54. It is clearly a form of the more robust species. *C. fothergilloides* HBK. is quite variable, and some forms are hard to separate from *C. parvifolius*. I studied this latter carefully in the Sierra Mojada in May, 1892 (Mexico).

The following are some notes on *C. ledifolius* and its variety. The species sheds its leaves late in the second season.

July 2, Muncy, Nev. Leaves lanceolate to linear, margins revolute, **nearly glabrous, bark dark gray.**

November 19, Tintic, Utah. 7,000 feet altitude, leaves old, lanceolate, short woolly on both sides, typical form.

June 12, 1891, Dutch Mountain, Utah. Typical form; leaves broadly lanceolate, not revolute, large, glabrous on both sides, or nearly so below, petiole 2 to 3 lines long, calyx white woolly and tips with a tuft of wool.

July 8, 1891, Ruby Hill, Eastern Nevada, 8,500 feet altitude. Leaves lanceolate, glabrous on both sides, slightly revolute, calyx and tips pubescent only with very short wool.

June 20, 1892, Mt. Ibapah. Leaves broadly lanceolate, slightly pubescent, not white beneath, varnished, slightly revolute.

June 23, 1892, Mt. Ibapah, Western Utah. Leaves oblanceolate to lance-oblong, glabrous on both sides, calyx pubescent.

June 23, 1892, Spring Creek, Eastern Nevada, altitude about 7,000 feet. Leaves, older ones, linear lanceolate, 3 lines wide, scarcely revolute, upper surface nearly glabrous, lower white with very short and dense wool; other leaves on the same plant linear and revolute; anthers nearly orbicular and emarginate above and below.

Specimens No. 2, same locality. Leaves not revolute, lanceolate, an inch long, very woolly on both sides.

August 30, 1891, Moab, Southeastern Utah. Leaves glabrous and varnished, linear and cylindric, 3 to 8 lines long, ½ to 1 line wide; young branches short woolly. This is like Watson's type of *intricatus*, but with smaller leaves approaching the extreme form, with varnished minute leaves, collected by Coville in Southwestern Nevada.

June 9, 1891, Furber, Eastern Nevada. Tails of fruit 3 inches long, short plumose to within ½ inch of the tip, where they are bare; leaves linear-oblong, revolute or not revolute, very woolly or hairy on both sides. The length of the tails is determined by the weather. If it is dry they are very short and abortive; if wet, they are long.

May 20, 1891, Desert Mountains, Utah. Leaves 3 to 6 lines long, ½ to 1 line wide, varnished, cylindrical, densely fascicled.

May 16, 1891, Homansville, Utah. Leaves linear to lance-linear, glabrous or short villous, old leaves less revolute; flowers pubescent, plants less densely branched.

July 2, 1891, Muncy, Nevada. Broadest leaves 3 lines wide and 6 to 12 long, glabrous; narrowest, on the same plant, a line wide; bark darker than usual.

June 19, 1891, Clifton, Western Utah. Leaves 6 lines long, 1

line wide, linear, older ones glabrous and varnished, edges revolute nearly to midrib, and so nearly cylindrical, very abruptly acute; petiole ½ line long; leaves fascicled at the ends of branchlets; intricately branched; bark white throughout, or nearly so. Others from the same place have the leaves 4 lines long, narrowly elliptical, nearly glabrous, and the under surface not chalky white, as is usual in the type.

June 9, 1891, Furber, Eastern Nevada. Branchlets more slender; leaves less crowded, 2 to 6 lines long, younger ones white silky villous, and both sides alike, narrowly oblong, blunt, some scarcely revolute; tails an inch long, the upper half bare, plumose part with hairs 2 lines long and densely white, the hairs gradually growing shorter to the beardless tip. This latter is the case in all forms; calyx 3 lines long.

Specimens No. 2. Leaves very short-woolly, chalky white below, some scarcely revolute; calyx 4 lines long; otherwise as the above.

Specimens No. 3. Leaves densely white woolly, oblong linear, 3 to 4 lines long, 1 to 2 wide, broadest not revolute.

There are many other forms, but those given show the general trend. The variety is usually a densely and intricately branched shrub, 3 to 5 feet high, with light gray bark, abounding in rocky ravines and cliffs and rocky hillsides, forming a large part of the brush of the low mountains. It abounds below 7,000 feet altitude, but rarely grows much higher. The type begins at about 7,000 feet altitude, and runs up to subalpine on the higher mountains. On Ruby Hill, at 9,000 feet altitude, I saw the type matted like the firs near timber line on the loftiest mountains. Both the type and the variety are very much affected by the soil and moisture where they grow. The variety seems to be a form of the type that has adapted itself to conditions that the type, from its larger surface of leaves, cannot do. It is strange that Watson never saw this plant in Nevada, where he spent a season, and where it is very common. It was doubtless an oversight, as he also reported that he did not see *Juniperus Californicus* var. *Utahensis* (as it is now called) in Utah, while it is the only tree on Antelope Island, and the island is black with it, and was when he was there camping. It is also found everywhere in Utah.

RIBES CEREUM Dougl. The flowers have a cannon-shaped calyx; petals white, rounded at tip: calyx tips reflexed; fruit yellowish red

and woolly, as well as glutinous. It is occasional in Western Utah and Eastern Nevada.

ŒNOTHERA JOHNSONI Parry Am. Nat. 9, p. 270. This very poorly described plant is said to have elongated stigmas, petals an inch long, calyx tube not shorter than the leaves, capsules 9 to 12 lines long, somewhat 4 angled, strongly nerved, not crested, and to resemble (*E. primiveris*, and to be very common at St. George, Southern Utah. The species which I have collected abundantly in Western Utah and Eastern Nevada is perennial, cæspitose from a many-branched root, which is covered at the summit with the dead petioles of former leaves, acaulescent or stems an inch or two long; leaves lanceolate, gradually decurrent into the petiole, which is 1 to 3 inches long, and never more than ½ the length of the blade; blade entire or undulate, or irregularly and sparsely dentate with sharp teeth; whole plant hoary with a dense, soft, and very short pubescence; calyx tips free in the bud; calyx splitting on one side and reflexed in flower, lobes 1 to 1½ inches long, tube 3 to 5 inches long and erect, with 8 striæ; petals rhomboidal, entire or slightly lacerate on the edge; 2 to 3 inches wide, and 2 to 2½ long, golden yellow, palmately veined with 3 very prominent and several intermediate veins, each feather veined in addition; the petals, in drying and fading, turn red, and resemble the meshes in the web of a frog's foot; stamens ½ line wide and 6 lines long, versatile, yellow; stigma lobes 4 to 6 lines long, ¼ line wide; capsule ovate, broadly winged, not nerved or veined, less than an inch long, not crested, hoary white; calyx also with scattered, fine, long, white hairs.

This grows on sunny southern slopes in very dry places, blossoms in June, and is by far the han lsomest species of the genus. It is vespertine. Rather common in Western Utah and Eastern Nevada at 6,000 feet altitude. Should it prove to be new, I name it (*Enothera Howardi*, after Mr. A. M. Howard, the gentleman in my party who saw it first.

ECHINOCACTUS PAPYRACANTHUS Eng. The flowers are an inch long, opening but little; stigma cleft a line deep into 6 anther-like divisions, papillose on the sides and upper surface; filaments 6 lines long; style almost as long as the petals, ½ a line thick, linear; the flowers open in the morning, and close in the afternoon, but apparently are not affected by cloudy weather. This grows in alkaline soil, and blooms in May. It is scarce everywhere.

ECHINOCACTUS SIMPSONI Eng. Should be called *Mamillaria Simpsoni*, as all its relatives are there, and it differs in but one respect from that genus, *i. e.*, having the flowers just a little above the base of the tubercle. It blooms in daylight, and closes partly at night. Rather common at high altitudes, *i. e.*, above 7,000 feet. La Sal Mountains, Eastern Utah, and through the Territory and into Nevada. June.

ECHINOCACTUS WHIPPLEI Eng. This opens in the forenoon, and closes partly between 5 and 6 P. M. It also opens in the day time if put in a dark place. It blooms in June, inhabiting the alkaline valleys and gravelly slopes. Occasional in Western Utah and Eastern Nevada.

OPUNTIA RUTILA Nutt. This is not distinct from *O. Missouriensis*. The flowers close partly at night, and in rain probably. Common. It blooms in May and June.

CYMOPTERUS CORRUGATUS Jones. This is not the type, but is the plant referred by Watson to *C. Fendleri*, and by Coulter and Rose to *corrugatus*. I could not get it with mature fruit. Involucre none; involucels broadly oval and scarious, or lanceolate and green, acute; fruit broadly winged; flowers white. Clayey hillsides near the Sevier River, Utah, below Juab. June, 1880. I doubt that it belongs to either species.

CYMOTERUS IBAPENSIS n. sp. Flowers white, in a head an inch wide; root large and long, thick and fleshy, erect, usually branched at summit, leafless but densely covered with what appear to be old leaf petioles; from amid these the scape arises and is 2 inches long in flower, its summit bears a tuft of many leaves; scapes in fruit 6 inches long or less; peduncles in flower shorter than the leaves, lengthening in fruit to 4 inches; leafless, striate, erect in flower and erect or decumbent in fruit; leaves fleshy and on drying finely wrinkled and so appearing to be finely pubescent, but glabrous, 3 inches long, ternate with the divisions pinnate to bipinnate, ultimate segments obtuse, either obovate and less than a line long or linear-spatulate and 2 lines long; base of petioles of the outer leaves much enlarged, nerved and sheathing, the rest less so; petioles not over an inch long, nerved; umbel of 6 to 8 rays, scarcely perceptible in flower $\frac{1}{2}$ inch long in fruit and stout; involucre none; involucels

of a few linear, acute, fleshy, not scarious scales, 2 to 3 lines long, distinct to the base; pedicels in fruit 2 lines long, filiform; flowers 5 to 8 from each ray; fruit 2 to 2½ lines long, broadly oblong truncate at each end, face concave only, about ⅓ of a circle, less than a line wide; oil tubes 3 between the ribs and 6 on the commissure; lateral wings a line wide, dorsal ⅓ less, all thick and corky for the size of the fruit. It is a close congener of *C. longipes* but differs in the size and division of the leaves, white flowers, small and simply concave fruit, and habitat. It is found only on clayey alkaline soil in the centers of the valleys. The fruit face is that of *C. montanus*. Deep Creek Valley, 5,000 feet altitude, June, 1891. A feature of the flowers that is more or less common to all the genus is in the petals, which are triangular lanceolate from a broad base, thick, deeply sulcate, barely acute, with incurved apex, so that the tip touches the disk between the contiguous edges of the petals; anthers black purple, reniform cordate, lying on the recurved filament next the edges of the petals like seeds in a five-celled pod, just bursting forth; they are very pretty; the filament straightens and thrusts the anther ½ a line beyond the petal; it then bursts; style not exserted at first.

CYMOPTERUS LONGIPES Watson. This plant is acaulescent at first and the yellow flowers are sessile in a rosette of green leaves, then the flower stalk lengthens always, is erect, and, after blooming, droops till the fruit is pendent, then as the fruit ripens the stem (peduncle) usually becomes erect again. The scape usually lengthens also, but not always. Abundant in the Wasatch and less common westward.

OROGENIA LINEARIFOLIA Watson. The Indians are fond of the raw bulbs. The flowers are white and the peduncles decumbent. This is one of the very earliest bloomers, and, though common, is seldom seen, as the plant is hardly visible when in fruit and even that disappears in a few weeks with the leaves.

TOWNSENDIA SCAPIGERA Eaton. The flowers open between 9 and 10 in the morning and close between 5 and 6 in the afternoon. It is frequent.

I think that Gray has confounded two well-marked species of *Bigelovia* in his cosmopolitan *B. graveolens*. One has a thyrsiform inflorescence, cylindric campanulate corolla with reflexed or widely

spreading lobes a line long, and usually glabrous stems and leaves; it grows 1 to 3 feet high. This is the *B. graveolens* Gray, really (Nutt). The other species is what should be called *B. nauseosa* (Pursh) and is the *Linosyris albicaulis* T. & G. This is also *B. graveolens* var. *albicaulis* Gray, and will include as varieties of it var. *latisquama* (Gray) and var. *hololeuca* (Gray). The type has a fusiform corolla, lobes almost never spreading and never reflexed, usually closed, often short; corymbiform inflorescence, usually flat topped with many heads, occasionally corymbs with few heads and somewhat thyrsiform in outline; stems white tomentose. The corolla is generally with closed lobes and then the fusiform character is very evident; it is always a little contracted at throat. The "cobwebby hairs" are found on all forms of the *B. graveolens* of Gray and are of no value.

Biglovia albida Jones. This name was not one of my choosing, but was insisted upon by Dr. Gray, who would not believe that I was correct in saying that the flowers were white. I have again had an opportunity to study this plant growing and find that the flowers are pearly white, the dirty white color of the dried specimens is due to the viscid matter of the heads coloring the flowers. The plant is 1½ to 2½ feet high, grows in clumps like the others, but more open; it is densely fastigiately branched at the top. It is found only on alkaline soil in the valleys and grows alongside of *Sarcobatus vermiculatis*. It is locally abundant on the eastern side of the Deep Creek Mountains, also in Spring, Antelope, and Steptoe Valleys, in Western Utah and Eastern Nevada.

Helianthella argophylla (Eaton) Gray. This botanical nomad, which has been successively called *Tithonia argophylla*, *Encelia argophylla*, *Encelia nudicaulis*, *Helianthella nudicaulis*, and now rests under the above name as the proper one, is cæspitose from a deep woody root, 1 to 1½ feet high (the peduncles); hoary with a dense, soft, and very short pubescence; old leaves silvery white, from nearly reniform to ovate, always with a cuneate base, and with a very long and margined petiole, 3 nerved, cauline none, or a rudiment, or occasionally there is a normal leaf at the base of the peduncle, blade 2 inches wide (usually), and an inch long, obtuse and entire; leaves very many and crowded at the root; petioles 5 inches or less long; bracts lanceolate acuminate from a broad base, either

like the leaves or softly tomentose in pubescence, in several series, not recurved, widely spreading in fruit because of the expanded head, which is hemispherical in fruit, not surpassing the disk flowers, obtuse; heads an inch broad and ½ an inch high, nodding in fruit usually; flowers nearly golden yellow; rays about 20, 2 inches long, and ½ inch wide or smaller, narrowly elliptical, minutely 5 toothed at the apex, neutral, usually with two loblets, one near the base of the ligule, and the other near the base of the blade; these lobelets are 3 to 8 lines long, and either green or yellowish: disk flowers urceolate-cylindric, 3 lines long, a line wide; proper tube a line long, very narrow, glandular; lobes reflexed, short, and hispid at tip; style tips bluntly triangular; ovaries nearly linear and slightly widened at tip, white silky with chaff-like hairs; margin hyaline and very hairy; apex with two scale-like awns equaling the short tube; ovaries 4 lines long exclusive of the awn, and flat; mature akenes obovate cuneate, and truncate to narrowly cuneate, black, with white callus margin, which is long villous; body of akene sparsely hairy; pappus awns present or absent; crown entire or lacerate, ½ a line high or almost wanting. The leaves are thick and the whole plant so nearly simulates *Balsamorhiza sagittata* that I have no doubt it is quite common where that plant has been supposed to be abundant. It is sometimes found growing near it also. It abounds in Western Utah and Eastern Nevada on sunny and dry hillsides, on the southern slopes, in bare places, from 6,000 feet altitude down. It is abundant at Detroit, Dugway, and Gold Hill, Western Utah, and at Furber, Glencoe, etc., in Eastern Nevada, and doubtless abounds throughout Nevada and Southern Utah. My large and varied material and my field studies make it certain that the two species *argophylla* and *nudicaulis* are identical, and the older name must prevail.

BALSAMORHIZA SAGITTATA Hooker. The horses seem to like the leaves, as I noticed my animals eating it with evident relish. It is frequent throughout the Great Basin region.

TETRADYMIA GLABRATA Gray. The spines of all the species arise from the bark. In this, the "spineless" species, they are present and formed like the other spiny species, but they are so weak and narrow the same year they are formed that they are called spine-tipped leaves, and as they fall at the end of the season they are not dignified with the name of spines. In *T. Nuttallii* T. & G. the spines persist till the second year and then fall.

ARTEMESIA TRIDENTATA Pursh. This is considered a sure remedy for pneumonia, being taken internally, and also a poultice made of it and applied to the chest. One of my men was taken violently sick with mountain fever, his temperature going up to 104° and remaining there; when other remedies failed, I gave him a large quantity of the cold infusion of the leaves, which cured him in a few days.

MALACOTHRIX TORREYI Gray. The flowers close at night.

CREPIS OCCIDENTALIS Nutt. The flowers close at night.

LYGODESMIA SPINOSA Gray. This plant it seems to me has been wrongly referred to this genus; it is a better *Stephanomeria;* in habit it closely resembles the perennial species and also *Chætadelphia*, which is hardly distinct. In some specimens recently sent me from Idaho by Mrs. Brodhead I found the upper $\frac{1}{5}$ of the pappus was long plumose like *Stephanomeria* in many cases, while the rest of the pappus was strongly barbellate. The pappus is stout at base and differs from *Stephanomeria* in being multisetose only.

PRIMULA BRODHEADÆ n. sp. 2 to 4 inches high; 1 to 4 flowered; scape 2 to 4 inches long; leaves 1 to 4 inches long, narrowly elliptical, rounded at apex, glabrous, rather thick, smooth, entire, narrowed at base to a winged petiole an inch or less long; flowers purple, about 5 lines wide, lobes orbicular or nearly so, notched, with a very short claw 2 lines long, tube exceeding the calyx by 2 lines; funnel form above the calyx; calyx lobes 1½ lines long and subulate lanceolate, barely acute, equaling the tube of the calyx; pod nearly spherical; pedicels of lateral flowers about a line long, the terminal one 2 to 6 lines long; bracts oblong to ovate lanceolate, entire or toothed at apex, 1 to 6 lines long; base of plant covered with the dead sheaths of former leaves; roots like those of *P. Parryi.* Marshy places at Ketchum, Idaho, May to early June, altitude 6,000 feet. The perfume at first is rather strong and sweet. Dedicated to Mrs. Brodhead, the collector.

Var. MINOR n. var. Leaves an inch long or less, elliptical oblanceolate and acute, thin; lobes of the corolla as large as the type, but obovate; lobes of the calyx longer than the tube; flowers 1 to 2 on the scape; bracts long; plant 2 inches high. Bayhorse, Idaho, July 1, at 8,000 feet altitude, in marshy places. This is between *P. Parryi* and *P. nivalis*, Ledeb, but if the characters given in the Synoptical Flora are good this is a new species. I suppose this species is

the same as var. *Wilcoxiana*, Wood of *P. Parryi*, but I do not know that that was ever characterized in print.

GILIA PUNGENS Benth. is vespertine. I watched it on June 19, 1891, and found that the flowers opened after dark and closed at 7:30 o'clock A. M. I noticed the same thing in *G. Watsoni* Gray, and have no doubt that the same is true of *G. Californica* also. The flowers of *G. inconspicua* and *G. leptomeria* I have never seen fully opened except in sunny weather.

TRICARDIA WATSONI Gray I have found again in two places on Dutch Mountain, Western Utah. It is very rare.

ZYGADENUS PANICULATUS Watson is regarded as a good remedy for felon. The root is baked and applied to the sore.

EPHEDRA NEVADENSIS Watson is regarded as a cure for canker in the mouth and for diarrhœa. It will also produce the piles. The virtues seem to lie almost entirely in the pitch, which, when broken up, is a fine yellow powder and very powerful.

JUNIPERUS CALIFORNICUS Carr. var. UTAHENSIS, Eng. I saw this growing on the top of the Champlin Mountains, Utah, at 7,700 feet altitude, and all matted down and flat-topped, like *Abies fallax* and other conifers above timber line on our highest mountains.

PINUS MONOPHYLLA Torrey. This is very interesting in its young state. Until it is about 5 years old it is scarcely distinguishable from *Abies*. The primary leaves are an inch long, flat, and sharp. After that they grow shorter and little buds begin to appear in their axils; as these develop the leaves dry up and fall off, and there is a complete transition from the fully developed primary leaf to the minute bracts that subtend the young secondary leaves. Generally there are one or two cylindrical leaves scattered along the young stems and with their normal sheaths, while all around them are the primary leaves. I find that the leaves of *P. monophylla* are much more robust and vigorous than those of the variety *edulis* Jones, and so it is far more likely that *edulis* was derived from this than that *monophylla* was derived from it, as it can in no sense be considered a "depauperate form of *edulis*;" in addition, the cones are generally more robust and better developed, though there is an endless series of all sizes and shapes dependent upon the weather in August when the cones are growing. I find that the formation of seeds in the Western conifers, of our region at least, is due to the weather in August. If it

is rainy in that month, as is seldom the case, then the trees fruit abundantly, but if it is dry they seed but little or not at all.

INDICA'TIVE PLANTS.

Occasionally we are regaled with accounts of these plants, and one poor species after another is put forth as an infallible index of mineral. *Amorpha canescens* has recently been called the "lead plant," and it is stated that it indicates the presence of lead. If that be true, then the whole State of Iowa, especially the prairie portion, is a vast lead field. Unfortunately there is but little lead known in Iowa as a whole. *Eriogonum ovalifolium* is also made to do service for silver and arsenic in Montana. In Utah it is seldom found near silver mines, and when it so happens that they exist as low as the region that the plant frequents, then it is no more abundant there than it is over thousands of square miles that have no mineral. The plant abounds in all our valleys, and the color is either white or pink, and I dare say that arsenic has nothing to do with the coloring; it is far more likely that it is due to iron, which may or may not be near mines.

UTAH NAMES OF LOCALITIES.

In almost all the monographs and books giving localities of Utah plants the antique spelling of King's Report is adhered to. Isn't it about time that those relics are given a decent burial? They were invented by some enthusiast in Indian dialects who felt it necessary to put an "h" on every broad "a," whether it belonged there or not. Southern Utah is still groaning under the burden of the outlandish names applied to well-known and previously better named valleys, plateaus and mountains. It is no excuse for these that the names were given by the U. S. Geological Survey, for it has no right to change well-known names for those of its own creation. Some new names for well-known ones are as follows; Kaibab Plateau for Buckskin Mountains, Tushar Mountains for Beaver Mountains, House Range for Swazy Mountains, Wheeler's Peak for Jeff. Davis Peak, Toang Mountains for Toano Range, Mt. Emmons for Star Peak; among the outlandish names applied are Kaiparowits Plateau, Paunsagunt Plateau, Markagunt Plateau, etc.

Two of the bad spellings that I see most frequently in our botanical books are "Wahsatch" for Wasatch, the latter the correct one, and "Uintah" Mountains for Uinta Mountains. Coulter's Manual

errs on the former at all times, also all of Gray's and Watson's publications, and the monographers.

[I had supposed that I had made it sufficiently clear that I was the author of the var. *breviflorus* of *Cercocarpus parvifolius* Nutt. in the original paragraph in which it was printed, but it seems that there is at least one person who has not clearly understood it, so I will say again that the var. is to be credited to me alone.]